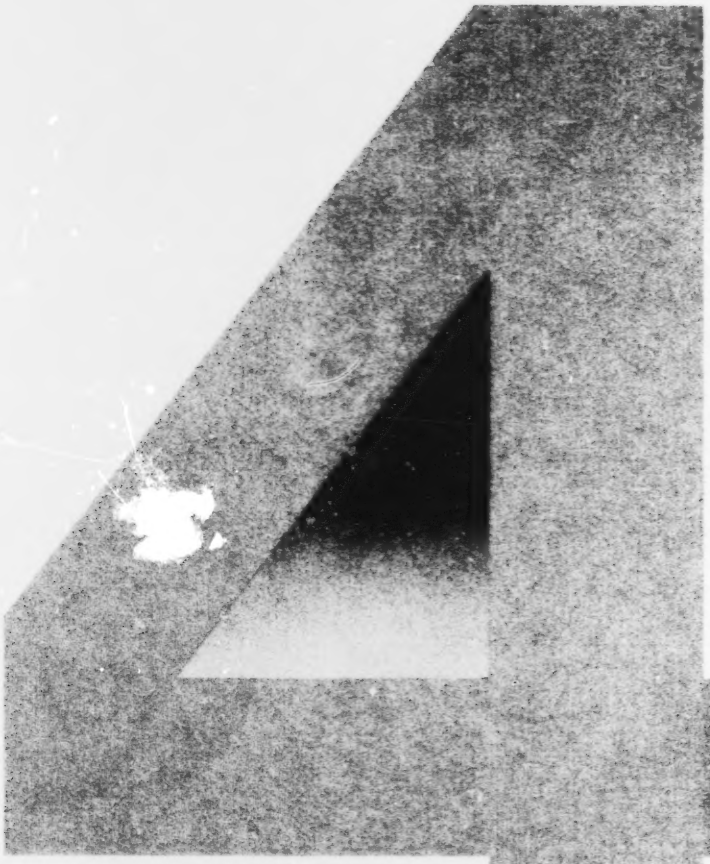

Alberta Heritage Foundation For Medical Research

4th Annual Report

1983 - 1984

New Directions

1983-1984 marks the fourth year of operation for the Alberta Heritage Foundation for Medical Research. Four years ago the Foundation was an exciting and challenging experiment — to build a strong community of first-class researchers by capitalizing on Alberta's own creative scientists and recruiting many more of the world's best.

The Foundation is no longer an experiment in business and science. It is a dynamic organization which has contributed more than $67 million to over 1,000 scientists, in grants large or small.

After four years, the grants and the policies behind them are beginning to bear fruit. Individual researchers are responding to the support and freedom and are moving forward in new directions. Sparks are flying as investigators from different disciplines come together in new groups. Large numbers of young people are joining the scientific community and invigorating it with their enthusiasm and energy.

After an initial period of exploration and stabilization, the Foundation itself is moving in new directions, initiating innovative programs and revising policy to respond to current needs.

As a research-funding organization, the Foundation acts primarily as a catalyst. The essence of the venture and adventure, takes place in the laboratories and clinics of the medical researchers, be they distinguished scientists or first-year summer students.

An Overview

In November 1979 an Act of Legislature created the Alberta Heritage Foundation for Medical Research to establish and support a balanced, long-term program of medical research based in Alberta. Foundation activities are directed toward the discovery of new knowledge and the application of that new knowledge to improve health care of Albertans and all people.

To build a balanced program, the Foundation supports basic and clinical scientists, both well-established people and young people beginning new research careers. Investigators explore a broad spectrum of disciplines such as: biochemistry, microbiology, pediatrics, immunology, neurology, dentistry, pharmacology and many others.

The Foundation is supported by a $300 million endowment fund which generates interest revenue for operating expenses. The Foundation stands at arm's length from the government under the management of a group of distinguished Trustees.

The long-term nature of medical research is recognized in the fact that a detailed report of activities is required triennially. This is the first Triennial Report and also the third Annual Report submitted to the Legislature. Every six years the Foundation's work will be reviewed by an International Board of Review.

Awards and Grants

The main activity of the Foundation is an awards and grants program designed to establish a critical mass of career scientists in Alberta. The program includes:

- Heritage Medical Scientist and Scholarship, and Clinical Investigatorship Awards
- Studentships (full-time, part-time, and summer)
- Fellowships
- Establishment Grants for New Investigators
- Grants for Major Equipment
- Grants for Equipment Maintenance
- Research Professors-in-Residence
- Visiting Scientists to Alberta
- Visiting Scientists from Alberta
- Visiting Lecturers
- Visiting Professors
- Travel Grants
- Grants for Conference Support

Much of the Foundation's work is carried out on the advice of a Scientific Advisory Council with 13 members who represent the national and international medical scientific communities. The international nature of the Council ensures quality peer review according to the highest standards and facilitates ongoing communication with researchers throughout the world.

The Council and its committees review and advise the Foundation on applications for loans, grants, research projects and professorships.

AHFMR Expenditures 1984
Total $28.8M

Major Equipment Grants and Maintenance (excluding Establishment Grants)	$5.7M
Scholarship/Heritage Medical Scientist Awards and Establishment Grants	$7.7M
Fellowship Awards and Research Allowances	$6.1M
Studentship Awards and Research Allowances	$3.1M
General Research Grants*	$1.8M
Research Support Costs and Institutional Grants to Universities	$3.1M
Administrative Costs	$1.1M
Scientific Policy and Evaluation Costs	$0.2M

* Conference Grants, Visiting Scientist Grants, Travel Grants to Universities and Research Professors-in-Residence

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"I'm excited about the spin-offs that have occurred. I've talked to people in the medical community and they say the quality of medical care has been enhanced by the influx of medical researchers. The presence of these people makes a quality of health care available to Albertans never available before, health care as good or better than that found in famous clinics like the Mayo clinic."

Dr. Gordon Swann Trustee, AHFMR

Letter from the Chairman

This fourth Annual Report of the Alberta Heritage Foundation for Medical Research, including the audited financial statements of the Foundation for the year ended March 31, 1984, provides impressive evidence of the Foundation's progress in providing funding for a balanced long-term program for medical research based in Alberta.

Expenditures of $27.6 million under the heading of "scientific affairs" increased by 27.7% in the year under review. Funding in this category has increased every year and cumulative expenditures now exceed $67 million. Projections of expenditures for the year ending March 31, 1985 call for a continued increase. Those outlays reflect the Alberta medical scientific community's response to the Foundation's program of grants and awards through the submission of meritorious research proposals.

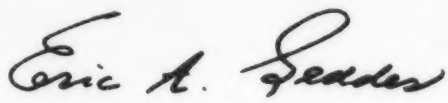
The original Endowment Fund, the income from which is available to the Foundation was established at $300 million. On March 31, 1984 this Endowment Fund increased to $418 million through the investment earnings of the Fund and the reinvestment of unexpended earnings during the first four years of operation. Such unexpended investment earnings remain available to the Foundation for its purposes. It is estimated that the Endowment Fund will earn a further $48.5 million in investment income during the year ending March 31, 1985 thereby providing a stable basis for the Foundation's continuing activities, at least for the near term.

Following the release of the government's White Paper titled "Proposals for an Industrial and Science Strategy for Albertans 1985-1990", the Trustees have been considering where the Foundation could contribute to government science and technology policy. The Foundation welcomes the introduction of the White Paper and is highly supportive of one of its main thrusts — fostering the technology transfer process by which the commercialization of scientific research can be encouraged. While we strongly believe that the Foundation's principal contribution will continue to be the funding of high quality programs for a balanced program of basic and clinical research, we also believe that important benefits will accrue to both academic medicine and to Alberta if every effort is made to encourage the commercialization of research discoveries where such opportunities exist.

On behalf of the Trustees, I would like to acknowledge our deep appreciation to the Foundation's President, Dr. Lionel McLeod, who has provided leadership and wise counsel throughout the year.

Although small in number, the administrative officials and staff of the Foundation deserve special recognition and thanks for their dedication and for the high standard of their performance during the year.

Finally, the Trustees would like to again record their appreciation of the opportunity to participate in the governance of the Foundation during these important and exciting formative years.



Eric A. Geddes
Chairman

The President's Report

It is my earnest wish that the Foundation's Triennial Fourth Annual Report will offer a readable and informative description of the activities of Alberta Heritage Foundation for Medical Research. The report emphasizes new directions because, while continuing to offer the well established programs of research support, the Foundation has embarked on two new and potentially far-reaching directions during the past year. A new program furthers clinical research by providing additional funds and encouragement for the lengthy and demanding training required, and by establishing the trained clinician in a supportive research environment.

The Foundation also determined that it should provide funds for much needed research space to support new individual scientists joining Alberta's medical research community and to allow the development of major thrusts that would link basic research to more specific studies of illness, both its management and prevention.

The quality of medical research in Alberta has increased dramatically during the four years of new opportunity afforded by the Foundation. Alberta has become well known for the excitement created by the recruitment of very able medical scientists, both young and more experienced.

The Foundation is deeply indebted to many people who have shared their experience and knowledge — agencies such as the Medical Research Council of Canada, the members of the Foundation's Scientific Advisory Committees, and the many diligent and enthusiastic members of Alberta's medical research community who continue to give their very best to the problems and proposals placed before them by the Foundation.

For each decision taken by the Foundation, the medical research world in Alberta and beyond has provided advice, reviews, and recommendations and for this the Foundation is deeply grateful. In this way, each contributor becomes a part of the Foundation acquiring a stake in Alberta's future as a significant and important contributor to the benefits of critical medical research.

Dr. Lionel E. McLeod
President

From Lab to Clinic

New Clinical Research Program is Unique in Canada

The stream of knowledge pouring out of medical research labs around the world is astounding. Rapid technical advances in genetics, biochemistry, microbiology, physiology and other disciplines have opened up the workings of the human body in ways previously unimaginable. For example, Heritage Scholars in Alberta are learning: how nerves talk to one another; how a virus becomes attached to the host cell; how central processes in the cell are regulated by calcium; how certain types of white cells recognize a pathogen; how drugs move from the cell membrane to the interior; how life itself begins with cells differentiating into skin, hair, muscle, tissue, and so on.

Exciting as this all is, there remains the sometimes unanswered question, "So what?". What does this mean to me as a patient?

Logically there has been and always will be a lag between the time knowledge is produced in the lab and the time it is applied in the clinic. However, too often the gap is too long and wide for one primary reason. There is a world-wide shortage of clinical researchers and Canada is no exception.

As opposed to bench or laboratory research, clinical research may be defined as studies dealing with human subjects conducted by physicians. Several studies indicate that physician-researchers are scarce for a number of reasons: lack of research training, lack of funding, the widening gap between the incomes of researchers and the incomes of practising physicians, and too few role models.

When the Foundation was being planned with the advice of distinguished researchers and administrators of other funding bodies around the world, they all said the same thing. If the Foundation could do something about the critical shortage of clinical researchers, it would be making a most significant contribution to medical science.

The Foundation has accepted the challenge and done something about the problem: a new program was initiated to support clinical researchers. It has been carefully designed to attack the problems plaguing the struggling clinical research community. Under the new program, young medical doctors are given two kinds of necessary support: funds and the opportunity to work with established clinical and basic investigators who will help them acquire additional research expertise.

"My contention is that in the world in which we live we need more clinical investigators ... To me the whole future is in doing something about human disease as you see it at the bedside."

Dr. Rosalyn Yalow - Nobel Laureate (AHFMR luncheon, June 28/83)

Centres of Clinical Research

Grants are available to establish new multidisciplinary centres of clinical research headed by a senior clinical scientist (Heritage Medical Scientist). The centres will include clinical and basic investigators and may be established within an existing clinical department such as cardiology or pediatrics, or may be freestanding as a special multidisciplinary group. While an excellent record by the senior scientist is most important, the Foundation also encourages proposals which foster new areas of research, deal with clinical epidemiology (data on who gets what diseases), or evaluate the benefits of clinical care.

Three types of individual awards give scientists financial and educational support. A Clinical Investigatorship provides the fully-trained clinical specialist with supervised research experience. It allows the new graduate to work in a multidisciplinary setting where he or she is guided by productive, competitively-funded scientists. The Investigatorship is a precedent-setting position not presently available in the rest of Canada.

A special Fellowship program for people with a medical, dental or equivalent degree includes an enhanced research allowance for travel and technical assistance or supplies. Transfer to clinics outside Alberta is permitted with the support of an Alberta University. The Foundation also offers a special traineeship in clinical research design and methodology. This award allows young faculty members to train at established clinical research centres outside Alberta.

The initial response to the new program was most encouraging. 33 scientists applied for the new Clinical Fellowship and 6 for Clinical Investigatorships. The quality of the applicants and the enthusiasm of their sponsors suggests the new program will successfully attract more investigators to patient-oriented research.

In the next few years, new information on cell biology and physiological processes should have increased significance for Albertans because physician-researchers will begin to bridge the gap. On one hand the clinicians will carefully transfer the basic knowledge to the bedside. On the other hand, physicians caring for people will bring their observations and questions to the basic scientists in the lab so that most relevant problems are pursued.

This new Clinical Research program is an important step in fulfilling the Foundation's mandate to provide a balanced long-term program of medical research in Alberta.

Major Research Facilities Planned

With 5 Heritage Medical Scientists, 58 Heritage Scholars in place, and hundreds of students and fellows, the Foundation is well on the way to amassing a critical number of people who will make things happen. Dr. McLeod, the Foundation's President, anticipates that in the next two or three years there will be some 160 to 180 scholars in place along with their technicians, research assistants and students. Obviously growth of Foundation activities means the growth of the departments at the universities and it's not surprising space has become an issue.

While the Foundation has always funded people, not capital projects, it became clear there simply isn't enough room to accommodate all the new groups of researchers coming on stream. The infrastructure grants the Foundation gives universities for items such as renovations are only a stopgap for the larger need.

Consequently, in consultation with the universities, the trustees agreed to accept proposals for new research facilities to support clinical research at The University of Alberta and The University of Calgary. Each institution was given a grant to prepare the proposals. It's anticipated the facilities will cost in the range of $30 million apiece which will be drawn from the Foundation's unexpended interest revenue accumulated over the last four years.

"It's a decision that had to be made to answer the problem."

Dr. McLeod, President, AHFMR

The new facilities will do more than simply house researchers. By careful design of the space and judicious use of shared equipment, the buildings will facilitate interaction among basic and clinical scientists and will provide the necessary environment for multidisciplinary groups. This is extremely important to the policies of the Foundation as established by the Scientific Advisory Council.

The buildings will complement the new clinical program which is also based on the premise that creative and productive science will more likely result when groups of people, each with their own distinct approach, work on a common problem and "cross-fertilize" one another. Even in the planning stages, the commitment to build the research facilities is an aid in recruiting superior medical researchers to Alberta.

Building a Community

New scholars track tough questions — from the causes of juvenile diabetes to the nature of seizures.

Twenty years ago, medical researchers usually asked, "How does the healthy body break down?" In the 80s, with revolutionary advances in research technology, scientists back up a step and ask, "How does the body tick in the first place?"

New Heritage Scholar Dr. Wayne Giles studies the prime ticker itself — the heart. The Foundation was pleased to recruit Giles from the University of Texas because he is one of the few scientists in the world who has developed a new technique to measure electrical currents in a single, isolated heart cell. This electrophysiological advance allows Giles to explore the very source of heart activity. Giles also works with physicians to find out how certain drugs observed to be effective in cardiac care actually work.

Giles is another returned Albertan who has established a reputation in the United States.

New 1983-84 Scholars like Dr. Wayne Giles have been chosen for their expertise and originality. Many, like Giles who joined an eight-person Heart Research Group at The U of C, add to areas of research already strong in Alberta. Another recruiting "coup", Dr. John Northup, added hormone regulation to the world-class Cell Biology Group. Dr. Donald Woods' research on lung infection complements the work of five other scholars conducting leading research in infectious diseases. Brian MacVicar's study of brain seizures gives more depth to the active neuroscience group at The U of C.

Some of the new scholars introduced relatively new research thrusts to the Alberta scene. For example, "What causes obesity?" asks Dr. Henry Koopmans in his investigation of internal food uptake. Dr. David Mortimer asks, "How can we identify and alleviate male infertility?"

Other Scholars bring their background and expertise as medical doctors to ask the most important questions in the laboratory. U of A pediatrician, Dr. Martine Jaworski, conducts animal and clinical research to determine how heredity and irregularities in the immune system may contribute to juvenile diabetes. At the U of C, Dr. Gerald Minuk maintains a limited medical practice while conducting both basic and human research on liver function. Another young M.D., Dr. Jutta Preiksaitis, is conducting clinical work to understand the pathogenesis of an infection related to blood transfusions and hopefully identify high risk patients.

Four Heritage Medical Scientists Appointed

Like any other community, the medical research community needs respected leaders who guide others to excellence. The Foundation recognizes this with its most senior award, the AHFMR Heritage Medical Scientist Award. In 1983 four people were appointed Heritage Medical Scientists: Dr. Peter Allen, Professor, Department of Applied Sciences in Medicine at The U of A; Dr. Joseph Davison, Professor, Department of Medical Physiology at The U of C; Dr. John Tyberg, Professor, Departments of Internal Medicine and Medical Physiology at The U of C; and Dr. James McGhee, Associate Professor, Department of Medical Biochemistry, also at The U of C.

Though all have distinguished research records, they are particularly recognized for their innovativeness and ability to stimulate research and work successfully with other investigators.

"My colleagues in the States are jealous of my funding here."

Dr. Donald Wood, Heritage Scholar, U of C

Dr. Peter Allan was recruited from Nottingham University in Great Britain to develop interdisciplinary research in Nuclear Magnetic Resonance, a revolutionary method of imaging the body and studying organ metabolism. Dr. Davison, formerly a Heritage Scholar and originally from Scotland, works with a group of

scientists investigating the gastrointestinal system. A native Canadian, Dr. McGhee, was recruited from The National Institutes of Health (U.S.) to add his pioneer work on gene expression to the large Growth and Development Group at The U of C. Dr. Tyberg, a Professor at The U of C since 1981, provides expertise to the Cardiovascular Respiratory Research Group at The U of C.

This brings the total of Heritage Medical Scientists to five. Dr. Jerry Wang, Head of the Cell Regulation Unit at The U of C was the first to receive the appointment in 1982.

(For more detail on research conducted by Scholars and Heritage Medical Scientists, see the Appendix.)

Pointing the Way

Visiting Scientists Advise Albertans

To what extent should we be concerned about poisons in the industrial workplace? Few scientists can answer because occupational health research is still in its infancy.

Last year the Foundation sponsored a visit by one of the world's few specialists studying problems on site in factories. While in Alberta, Dr. H.A. Waldron, Senior Lecturer at the Institute of Occupational Health at The London School of Medicine, advised scientists at The Universities of Alberta and Calgary, as well as members of the petroleum industry and the Occupational Health and Safety Division of the Alberta Government.

Waldron was one of 9 Heritage Visiting Scientists who came to Alberta during 1983/84. As in Waldron's case, many of the visitors bring years of expertise to fields which are relatively undeveloped in Canada. For example, Dr. James Bawden, Distinguished Professor of Dentistry at The University of North Carolina helped the U of A Dental Faculty plan an expanded program of research. Chief of the Oral Health Unit for the World Health Organization, Dr. David Barmes, also advised the dental faculty, stressing the need for more health services research.

In Calgary and Edmonton Dr. Jack Medalie discussed new possibilities for research in preventive family medicine. A former family physician and renowned researcher from Case Western Reserve University in Cleveland, Ohio, Medalie shared his insight into the needs and nature of clinical research. The Department of Family Medicine and Community Health Sciences welcomed his advice on developing new clinical studies.

In workshops and lectures, visiting scientists meet with students and fellows as well as senior scientists. This contact with distinguished investigators is an important addition to the educational program.

"Optimism is a major attribute of a good researcher. If you're pessimistic you will disregard intuitive thoughts that come to you as fantasy which is a fatal mistake in research."

Dr. Jerry Wang, Heritage Medical Scientist, U of C

The program also facilitates communication among Alberta's scientists and their colleagues in other centres. Frequently a visiting scientist will spark new inter-university collaborations.

Regardless of their home university or discipline, visiting scientists come away from Alberta with a common response. They are surprised to see such opportunities and impressed by the sense of excitement so evident in every laboratory.

Heritage Days Popular Forum

The 1983 Heritage Days dramatically demonstrated the progress of the Foundation. The sheer number of projects — over 240, mainly funded by the Foundation — reflects increased Foundation activity.

The annual Heritage Days provides a forum for Foundation-sponsored scientists to share their research progress. This year scientists not funded by the Foundation were also invited to participate. Unlike most scientific conferences, Heritage Days does not exclusively feature senior scientists. It is a forum for students and fellows as well, many of whom present their work for the first time to a critical scientific community.

This results in a free-wheeling interchange among researchers with all levels of experience. Each presenter was challenged by lively discussion following oral presentations. Two or three people would gather in front of poster sessions to earnestly exchange information for long periods of time. Scientists, both old and young, conveyed their energy and excitement and there was a definite sense of a growing community of scholars.

While presentations covered a range of basic and clinical research in many disciplines, theme areas were selected for major focus. These areas represent impressive areas of strength which are attracting more and more scientists from outside the province: cell physiology, endocrinology, gastroenterology, immunology, infectious diseases, genetics, and neurosciences.

"I've been tremendously surprised at the quality of science and scientists here. You have some of the best scientists in the world."

Dr. Michael Waterfield, Imperial Cancer Fund, England

The 1983 event also featured three eminent key speakers who presented new directions for research in immunology, cell regulation and oncogenes. There were: Dr. Alfred Singer of the National Cancer Institute, National Institute of Health, U.S.; Dr. Jerry Wang, Heritage Medical Scientist at The University of Calgary; and Dr. Michael Waterfield from the Imperial Cancer Fund, London, England.

Scientists of the Future

There is a mystique about scientists in the laboratory. We imagine he or she moves among thousands of dollars worth of complex equipment unravelling biological secrets at a furious pace. The reality is far more pedestrian.

A medical researcher spends hundreds of hours repeating procedures to test theories, a process that may take one year or ten — and then only if the grants last long enough. In order to learn the techniques, and more importantly, the approach to disciplines like genetics, biochemistry or microbiology, the researcher will train at least seven years and probably more. Then if he or she has no access to the best labs with the most qualified mentors the research may be second or third rate anyway, with little chance of sustained funding in national competitions.

Small wonder that in the past becoming a medical researcher was an almost impossible goal for many young Albertans. The Foundation has significantly changed that. Funding scientists of the future is a priority and in 1983-84 261 students were supported. Of these, 167 were summer students including many undergraduates who were introduced to professional research for the first time.

All students work under an established researcher and collectively they have investigated an impressive variety of subjects. Projects range from

the development of anticancer drugs to a study of cardiac function in patients with diabetes.

Foundation support is more than monetary in the sense that Heritage Scholars provide the teachers necessary to build a strong community of investigators. These two kinds of support mean that emerging scientists no longer feel compelled to move to Montreal or Boston or England to pursue excellence in a research career. Foundation funding is keeping Alberta's young people home and attracting other "expatriates" back to the province. This is evident in the numbers of fellows supported — 125. (Fellows are researchers who have their Ph.D. and are continuing post-graduate work prior to establishing a laboratory of their own.)

While students clearly benefit from these new opportunities, they immediately give something back. Over and over, experienced scientists and especially visiting researchers comment on the excitement and energy of the young people. The youth help to attract other senior scientists because they recognize it is often the enthusiastic youth who pose the irreverent questions, who keep research from becoming narrow and ingrown.

Science Fair Winners Visit Labs

Every year hundreds of enthusiastic Canadian teenagers develop research projects on everything from the effects of smoking to applied robotics. The projects are part of the School Science Fair program sponsored by the Youth Science Foundation in Ottawa.

The program has long been recognized as a valuable training ground for young scientists and the Foundation was pleased to participate in six 1983 regional science fairs. The Foundation gave each science fair operating funds and a special AHFMR Award of Excellence for the best project in the life sciences category.

Winners of the AHFMR awards were given travel expenses to the national fair in Saskatoon and an expense-paid visit to a researcher's lab at The U of A or The U of C.

The young people were most enthusiastic about the lab visits. When sixteen-year-old Armellie de la Cruz of Fort McMurray visited Dr. Linda Reha-Krantz's genetics lab in June, the teenager returned home clutching a bag of sample cultures, a souvenir of the scientific world she would enter after high school graduation.

"What impresses me even more than the excellence of the Senior Scientists who have been brought to Alberta is the spirit of excitement and optimism that has been created among the young Alberta investigators who are just entering the field of medical research. Alberta and Canada will be reaping the benefits of this excitement and optimism for decades to come."

Dr. D.L. Sackett, Scientific Advisory Council

Meeting of Minds

N-Nitroso Compounds have been called carcinogens looking for a human cancer. Found everywhere in our food, drink, tobacco and air, the majority of the 300 compounds identified so far appear to induce tumors in 39 species of animals.

In September, over 250 scientists from around the world met in Banff to exchange the latest research on these compounds. The conference included an international epidemiological survey linking some of the compounds to incidences of certain cancer types.

At another Banff conference two months later, world leaders in a second field of cancer research presented their work. "The Fifth International Conference on Chemical Modifiers of Cancer Treatment" focussed upon the development of two categories of drugs: radioprotectors used to protect healthy cells during radiation treatment and radiosensitizers used to enhance the tumor-killing effect of radiation and chemotherapy.

These were only two of the 18 conferences sponsored by the Foundation during the 1983-84 year. Other events included workshops on specific areas such as computer interpretation of electro-cardiograms and symposiums on problems such as the mysterious neurological disease called dystonia.

As well as facilitating communication among members of the international scientific community, these conferences serve two other purposes. They highlight the quality work being conducted by Alberta researchers and they give young students and fellows outstanding educational opportunities.

Grants and Awards

Heritage Medical Scientist Award
This award was established to encourage the recruitment and establishment of a limited number of senior medical scientists to Alberta. A Heritage Medical Scientist is a leader in his field and is internationally recognized for the excellent quality of his scientific contributions. The successful candidate has to demonstrate an ability to develop and lead research groups and attract young people to medical science careers.

Distinguished medical scientists who are located in Alberta and whose stipend will terminate by reason of time limitations imposed by other research funding agencies are eligible. Highly successful Heritage Scholars are also eligible.

Total number of awards: 2
Expenditures: (including establishment grants)
$1,869,073

Scholarships
Alberta Heritage Medical Research Scholarships support investigators recently trained in medical research who have demonstrated considerable promise and ability to initiate and conduct independent research. An initial award is intended to provide an opportunity to develop medical research unhampered by heavy teaching and service duties.

Scholarships are granted by competition and based upon the excellence of the candidate, the originality and importance of the project, and the quality and adequacy of the research environment into which the host institution proposes to place the candidate.

Scholars also receive establishment grants.

Total number of awards: 14
Expenditures: (including establishment grants)
$4,588,623

Independent Establishment Grants for New Investigators
A Heritage Medical Research Establishment Grant is given to a new investigator who is not funded by the Foundation (who may or may not hold a Scholarship or equivalent award from another research granting agency). This grant is designed to help new investigators quickly achieve maximal research productivity by providing equipment, technical assistance, materials and supplies.

Total number of awards: 1
Expenditures: $275,129

Fellowships
Heritage Medical Research Fellowships provide qualified candidates with full-time post-graduate training in research in an area of medical science relevant to the aims of the Foundation. Fellows must have an M.D., D.D.S., D.V.M., Ph.D., or equivalent degree and must demonstrate high academic standing and evidence of research ability. Awards are granted by competition based on excellence.

Total number of awards: Full-time 118
Part-time 7
Expenditures: $3,737,873

Studentships
The Foundation provides three types of awards: Full-time, Part-time, and Summer Studentships.

There are a limited number of **Full-time Studentships** for students registered in full-time M.Sc. or Ph.D. programs, and who plan careers in medical research.

The University must accept students into a graduate program and invite students to apply for an AHFMR Studentship. Studentships are granted by competition and awards are made on the basis of excellence.

A limited number of **Part-time Studentship** awards are available to full-time students working towards professional health-related degrees, and seeking to spend substantial amounts of free time in medical research. Research required by the curriculum is not eligible for support.

Summer Studentship awards support promising Alberta university students who wish to spend their summer months (May to August) engaged in medical research:

Total number of awards: Full-time 89
Part-time 5
Summer 167
Expenditures: $1,922,825

Research Allowances
(Independently Funded Students & Fellows)

Holders of full-time Studentships and Fellowships awarded by another medical research agency using similar guidelines and standards are eligible to apply to the Foundation for a Research Allowance.

Total number of awards: Studentship 6
Fellowship 6
Expenditures: $43,000

Visiting Scientists
Awards for Visiting Scientists to Alberta enable a limited number of highly innovative and productive medical scientists to engage in medical research in an Alberta university for the purpose of bringing special knowledge and expertise to the host, the department, group, or institution.

Awards for Visiting Scientists from Alberta enable Alberta medical scientists to undertake collaborative research which they are unable to undertake locally due to inadequate technology or collegial expertise. Research funded must be an obvious step in the progression of a sustained research effort on the part of the Visiting Scientist.

The program allows Alberta's active researchers to participate in new and important breakthroughs in medical research emerging elsewhere.

Total number of awards: 14
Expenditures: $295,176

Visiting Professors
Heritage Medical Research Visiting Professorships are available for the purpose of recognizing and attracting truly outstanding medical scientists to visit Alberta to enrich and enhance the climate of medical research within the universities and the affiliated institutions active in medical research.

Total number of awards: 10
Expenditures: $23,421

Alberta Heritage Medical Research Visiting Lecturers
The Visiting Lecturer program helps Alberta universities attract outstanding medical scientists who can broaden and enrich the educational experience of graduate students and fellows. The program also gives Alberta investigators, individually or in groups, the opportunity to discuss their research with others expert in their field of medical research.

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Block Grant to University
Expenditure: $336,475

Alberta Heritage Medical Research Travel Grants
The Foundation annually gives Travel Grants to The University of Alberta and The University of Calgary to be administered by the Universities for the following purposes:

Attendance of faculty members at workshops, conferences and annual meetings.

Recruitment of researchers.

Short visits to discuss complicated experimental design and cooperative research and prepare publications stemming from cooperative research.

Short visits to other laboratories to study new research procedures and techniques and to host external investigators who can assist in the establishment of procedures and techniques.

Block Grant to Universities
Expenditures: $254,916

Professors-in-Residence
The Foundation offers a very limited number of Heritage Medical Research Professors-in-Residence Awards to provide a special opportunity for Alberta faculty members to spend one year in full-time research free of teaching and administrative responsibilities. The award is intended for the investigator whose research has achieved a point at which concentrated effort might be expected to result in unusual levels of productivity and important new knowledge. The award is not a substitute or supplement to regular university leave opportunity.

Total number of awards: 0
Expenditures: 0

Conference Support
The Foundation supports a limited number of conferences and workshops clearly related to the enhancement of medical research in Alberta and the transmission of significant new knowledge to those responsible for the management of patients.

Conference support is usually limited to the funding of a small number of distinguished medical scientists invited to participate as special lecturers or major participants. Funds also support a limited number of workshops on collaborative research and workshops which explore and evaluate new research fundings.

Total number of awards: 18
Expenditures: $313,751

Grants for Major Equipment
Major Equipment grants permit the University on behalf of investigators to purchase equipment essential to the conduct of high-quality research. Applications usually relate directly to research projects supported by competitive granting agencies.

Grants for Equipment Maintenance ensure adequate maintenance of major equipment wholly funded by the Foundation's Major Equipment Grants. Preferential consideration is given to expensive facilities providing support to groups of researchers and multidisciplinary projects, especially those facilities offering services to researchers with partial or full recovery arrangements for regular operating costs.

Total number of Major Equipment and Maintenance Grants: 119
Expenditures: (includes installation and maintenance) $4,119,390

Review Panel Members

Dr. Marvin Bala, Professor & Head, Department of Medicine, University Hospital, Saskatoon, Saskatchewan.

Dr. Lawrence E. Bryan, Professor, Department of Microbiology & Infectious Disease, Faculty of Medicine, The University of Calgary.

Dr. John Colter, Professor & Chairman, Department of Biochemistry, Faculty of Medicine, The University of Alberta.

Dr. Ronald T. Coutts, Professor, Department of Pharmacy, Faculty of Pharmacy & Pharmaceutical Sciences, The University of Alberta.

Dr. Joe Davison, Department of Medical Physiology, Faculty of Medicine, The University of Calgary.

Dr. George Drummond, Professor, Departments of Chemistry & Medical Biochemistry, Faculties of Science and Medicine, The University of Calgary.

Dr. Grant Gall, Professor, Department of Pediatrics, Faculty of Medicine, The University of Calgary.

Dr. Ross Hodgetts, Associate Professor, Department of Genetics, Faculty of Science, The University of Alberta.

Dr. E. Knaus, Professor, Faculty of Pharmacy, The University of Alberta.

Dr. Edgar Love, Professor, Department of Community Health Service and Obstetrics and Gynecology, The University of Calgary.

Dr. Ernest McCoy, Professor & Chairman, Department of Pediatrics, Faculty of Medicine, The University of Alberta.

Dr. Grant McFadden, Assistant Professor, Faculty of Biochemistry, The University of Alberta.

Dr. W. Paranchych, Professor, Department of Biochemistry, Faculty of Medicine, The University of Alberta.

Dr. Richard Peter, Professor & Chairman, Department of Zoology, The University of Alberta.

Dr. Mark Poznansky, Department of Physiology, Faculty of Medicine, The University of Alberta.

Dr. Jutta Preiksaitis, Assistant Professor, Department of Medicine, Faculty of Medicine, The University of Alberta.

Dr. Dan Roncari, Faculty of Medicine, The University of Calgary.

Dr. Otto P. Rorstad, Assistant Professor, Department of Medicine, Faculty of Medicine, The University of Calgary.

Dr. Sheldon Roth, Faculty of Pharmacology & Therapeutics, The University of Calgary.

Dr. Anthony S. Russell, Professor, Department of Medicine, Faculty of Medicine, The University of Alberta.

Dr. Gerry Scott, Professor, Department of Surgery, The University of Alberta.

Dr. Paul Scott, Associate Professor, Department of Oral Biology, The University of Alberta.

Dr. Richard Stein, Professor, Department of Physiology, The University of Alberta.

Dr. Alan B. Thomson, Department of Medicine, Division of Gastroenterology, The University of Alberta.

Dr. John Tyberg, Professor, Department of Internal Medicine & Medical Physiology, Faculty of Medicine, The University of Calgary.

Dr. Warren Veale, Professor & Head, Department of Medical Physiology, Faculty of Medicine, The University of Calgary.

Dr. Jerry Wang, Department of Biochemistry, The University of Calgary.

Dr. George Wyse, Associate Professor, Departments of Medicine & Pharmacology and Therapeutics, The University of Calgary.

TABLE 1: Grants & Awards Implemented From April 1, 1983 to March 31, 1984 Category – Value & Number of Grants and Awards*

CATEGORY	U of A	U of C	Other	TOTALS
Studentship				
Full-time	$ 764,520	$ 519,210	$ —	$ 1,283,730
	(53)	(36)		(89)
Part-time	9,976	6,194	—	16,170
	(3)	(2)		(5)
Summer	432,847	162,078	28,000	622,925
	(118)	(42)	(7)	(167)
Fellowship				
Full-time	1,467,510	1,352,600	828,635	3,648,745
	(47)	(44)	(27)	(118)
Part-time	—	89,128	—	89,128
		(7)		(7)
Independent Research Allowances				
Studentship	10,000	5,000	—	15,000
	(4)	(2)		(6)
Fellowship	5,000	—	23,000	28,000
	(1)		(5)	(6)
Scholarship/Establishment Grants	956,408	3,589,853	—	4,546,261
	(4)	(9)		(13)
Scholarship	42,362	—	—	42,362
	(1)			(1)
Heritage Medical Scientist/Establishment Grants	—	1,869,073	—	1,869,073
		(2)		(2)
Independent Establishment Grants	275,129			275,129
	(1)			(1)
Major Equipment Grants	2,570,275	1,290,587	51,506	3,912,368
	(61)	(33)	(2)	(96)
Equipment Maintenance Grants	94,140	112,882	—	207,022
	(10)	(13)		(23)
Conference Grants	158,149	130,602	25,000	313,751
	(7)	(10)	(1)	(18)
Visiting Professors	17,248	6,173	—	23,421
	17,248	6,173	—	23,421
	(6)	(4)		(10)
Professor-in-Residence	—	—	—	—
Visiting Scientist to Alberta	104,108	163,148	—	267,256
	(4)	(5)		(9)
Visiting Scientist from Alberta	20,641	7,279	—	27,920
	(3)	(2)		(5)
TOTALS	**$6,928,313**	**$9,303,807**	**$956,141**	**$17,188,261**
	(323)	**(211)**	**(42)**	**(576)**

* Values shown are committed amounts on the effective date of award.

TABLE 2:
Applications Received
From April 1, 1983
to March 31, 1984
Category – Number of
Applications Processed

CATEGORY	U of A				U of C				Other				TOTALS			
	# Appl.	A	R	W	# Appl.	A	R	W	# Appl.	A	R	W	# Appl.	A	R	W
Studentship																
Full-time	96	49	45	2	77	51	25	1	10	1	9	—	183	101	79	3
Part-time	4	2	2	—	2	2	—	—	—	—	—	—	6	4	2	—
Summer	162	110	52	—	94	61	31	2	12	2	9	1	268	173	92	3
Fellowship																
Full-time	98	45	52	1	75	47	26	2	24	15	9	—	197	107	87	3
Part-time	1	1	—	—	6	4	2	—	—	—	—	—	7	5	2	—
Independent Research Allowances																
Studentship	5	4	1	—	3	33	—	—	2	2	—	—	10	9	1	—
Fellowship	1	1	—	—	3	—	3	—	4	3	1	—	8	4	4	—
Clinical Fellowship	9	5	2	2	17	7	10	—	15	11	2	2	41	23	14	4
Scholarship/Establishment Grants	19	10	9	—	24	15	7	2	—	—	—	—	43	25	16	2
Scholarship	—	—	—	—	2	2	—	—	—	—	—	—	2	2	—	—
Heritage Medical Scientist/ Establishment Grants	1	1	—	—	3	3	—	—	—	—	—	—	4	4	—	—
Independent Establishment Grants	8	4	4	—	5	3	2	—	—	—	—	—	13	7	6	—
Major Equipment Grants	145	76	67	2	68	39	29	—	4	2	2	—	217	117	98	2
Equipment Maintenance Grants	16	10	6	—	16	12	4	—	—	—	—	—	32	22	10	—
Conference Grants	12	8	3	1	12	8	4	—	1	1	—	—	25	17	7	1
Visiting Professors	7	7	—	—	7	6	—	1	—	—	—	—	14	13	—	1
Professors-in-Residence	1	1	—	—	—	—	—	—	—	—	—	—	1	1	—	—
Visiting Scientist to Alberta	9	3	5	1	11	4	7	—	—	—	—	—	20	7	12	1
Visiting Scientist from Alberta	3	1	2	—	4	2	2	—	—	—	—	—	7	3	4	—
TOTALS	**597**	**338**	**250**	**9**	**429**	**269**	**152**	**8**	**72**	**37**	**32**	**3**	**1098**	**644**	**434**	**20**

A = Approved R = Rejection W = Withdrew

TABLE 3: Grants & Awards
Renewed/Continued
During the period of
April 1, 1983 to
March 31, 1984
Category – Number of
Grants and Awards
Renewed or Continued

CATEGORY	U of A	U of C	Other	TOTALS
Studentship				
Full-time	49	31	5	85
Part-time	1	—	—	1
Fellowship				
Full-time	50	30	14	94
Part-time	1	5	1	7
Independent Research Allowance				
Fellowship	4	3	1	8
Studentship	4	5	1	10
Scholarship/Establishment Grants	23	34	—	57
Scholarship	—	1	—	1
Heritage Medical Scientists	1	4	—	5
TOTALS	**133**	**113**	**22**	**268**

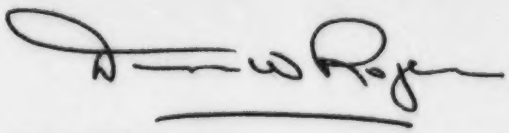
erta Heritage Foundation
Medical Research
ncial Statements
ch 31, 1984
itor's Report

To the Trustees of the Alberta Heritage Foundation for Medical Research

Alberta Legislature
Office of the Auditor General

I have examined the balance sheet of the Alberta Heritage Foundation for Medical Research as at March 31, 1984 and the statements of revenue and expenditure and revenue surplus for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Foundation as at March 31, 1984 and the results of its operations for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.



Douglas W. Rogers, F.C.A.
Auditor General

Edmonton, Alberta
July 16, 1984

STATEMENT A

Alberta Heritage Foundation for Medical Research

Balance Sheet

as at March 31, 1984

	1984	1983
ASSETS		
Deposits in trust (Note 3)	$ 6,027,558	$ 3,238,836
Accounts receivable (Note 4)	71,102	113,184
Accrued interest receivable	4,058	59,197
Prepaid expenses	2,794	3,455
Mortgages receivable (Note 5)	567,288	259,654
Fixed assets, at cost less accumulated depreciation and amortization	209,224	241,847
	$ 6,882,024	$ 3,916,173
LIABILITIES AND SURPLUS		
Accounts payable	$ 837,582	$ 665,243
Revenue surplus, Statement C	6,044,442	3,250,930
	$ 6,882,024	$ 3,916,173

The accompanying notes are part of these financial statements.

STATEMENT B

Alberta Heritage Foundation for Medical Research

Statement of Revenue & Expenditure

For the year ended March 31, 1984

	1984	1983
REVENUE		
Transfers from the Alberta Heritage Foundation for Medical Research Endowment Fund	$31,000,000	$22,000,000
Interest	630,060	1,192,180
	31,630,060	23,192,180
EXPENDITURE		
Scientific affairs:		
Scholarship and establishment grants	6,416,400	5,201,332
Fellowship grants and research allowances	6,143,662	3,842,290
Major equipment and maintenance grants	5,702,701	3,655,877
Studentship grants and research allowances	3,083,212	2,274,296
Research support costs	1,734,717	1,196,827
Heritage medical scientist grants	1,312,457	488,200
Institutional grants	1,070,077	2,705,280
Independent establishment grants	448,872	920,148
Visiting lecturer grants to universities	336,475	319,839
Conference support grants	314,254	423,209
Building planning grants	300,000	–
Visiting scientist grants	271,577	225,049
Travel grants to universities	254,916	185,630
Independent research allowances	108,567	111,891
Recruitment and planning grants to universities	30,052	17,752
Visiting professor honoraria and travel grants	26,663	12,135
Research professor-in-residence	8,000	8,000
	27,562,602	21,587,755
Administration expenses, Schedule 1	941,373	814,448
Scientific Advisory Council expenses	143,568	178,592
Trustee expenses	113,437	122,168
Other committee expenses	75,568	96,263
	28,836,548	22,799,226
Operating surplus for the year	$ 2,793,512	$ 392,954

STATEMENT C

Alberta Heritage Foundation for Medical Research

Statement of Revenue Surplus

For the year ended March 31, 1984

	1984	1983
Revenue surplus at beginning of year	$3,250,930	$2,857,976
Operating surplus for the year, Statement B	2,793,512	392,954
Revenue surplus at end of year	$6,044,442	$3,250,930

Alberta Heritage Foundation for Medical Research

Notes to the Financial Statements

March 31, 1984

NOTE 1

Authority

The Alberta Heritage Foundation for Medical Research operates under the authority of the Alberta Heritage Foundation for Medical Research Act, Chapter A-26, Revised Statutes of Alberta 1980.

NOTE 2

Significant Accounting Policies and Reporting Practices

(a) Transfers from the Alberta Heritage Foundation for Medical Research Endowment Fund:

Section 8 of the Act provides that money required by the Foundation shall be paid from a $300,000,000 Endowment Fund at the request of the Foundation. The Act also provides that payments shall not be made if they would result in the cost value of Endowment Fund assets being less than $300,000,000. On this basis, the total available for transfer to the Foundation as at March 31, 1984 amounted to approximately $118,000,000.

(b) Depreciation and Amortization:

Furniture and equipment is depreciated on a straight line basis at the rate of 10% per annum to a maximum of 90% of cost. Leasehold improvements are amortized on a straight line basis over the term of the lease.

(c) Changes in Financial Position:

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

NOTE 3

Deposits in Trust

Deposits in trust consist of deposits in the Consolidated Cash Investment Trust Fund of the Province of Alberta.

NOTE 4

Accounts Receivable

Accounts receivable consist of the following:

	1984	1983
Unexpended grants held by universities:		
Visiting lecturer	$19,572	$ 11,047
Travel	14,530	74,445
Recruitment and planning	—	9,892
Grant refunds	20,000	—
Miscellaneous	17,000	17,800
	$71,102	$113,184

NOTE 5

Mortgages Receivable

Mortgages receivable represents the unpaid principal on mortgage advances to research scientists.

NOTE 6

Commitments

As at March 31, 1984 the Foundation had committed the following amounts for scientific affairs expenditure:

Scholarship and establishment grants	$ 8,634,940
Fellowship grants and research allowances	2,743,517
Heritage medical scientist grants	2,279,016
Studentship grants and research allowances	1,044,203
Institutional grants	754,913
Major equipment and maintenance grants	678,057
Independent establishment grants	130,240
Conference support grants	61,250
Visiting scientist grants	57,044
Visiting professor honoraria and travel grants	6,432
Independent research allowances	2,500
	$16,392,112

NOTE 7

Comparative Figures

The 1983 figures have been restated where necessary to conform to 1984 presentation.

NOTE 8

Approval of Financial Statements

These financial statements were reviewed by the Audit Committee on July 16, 1984 and recommended for approval by the Trustees.

SCHEDULE 1

Alberta Heritage Foundation for Medical Research

Schedule of Administration Expenses

For the year ended March 31, 1984

	1984	1983
Salaries	$424,090	$435,713
Rental of premises	99,303	100,193
Public relations and advertising	92,495	29,217
Stationery, printing and office supplies	64,510	44,904
Consultant fees	56,254	30,325
Employee benefits	51,775	43,714
Depreciation and amortization	47,681	45,976
Travelling and accommodation	25,118	19,938
Maintenance	22,304	9,163
Vehicle	15,601	19,355
Postage and courier	11,859	5,168
Telephone	9,937	8,127
Recruitment	5,992	5,496
Accounting and legal fees	5,854	6,876
Insurance	4,762	6,505
Purchased services	3,218	—
Equipment rental	—	2,576
Miscellaneous	620	1,202
	$941,373	$814,448

Alberta Heritage Foundation
For Medical Research
Appendix of
Heritage Medical Scientists &
Scholarship Awards

Heritage Medical Scientist Awards

ALLEN, Peter, Ph.D.*
Professor, Department of
Applied Sciences in Medicine
Faculty of Medicine, The University of Alberta

Date of Appointment: 83/01/01

IMAGING AND BIOCHEMICAL APPLICATIONS OF NMR TO MEDICINE

Nuclear magnetic resonance (NMR) imaging is a new non-invasive technique for obtaining a picture of a cross section of part of the body. Though the technology has been used in physics and chemistry for several decades, it has only recently been applied to medicine with the advent of sophisticated computing technology.

The medical applications of NMR are most exciting and promising because the technique is safer and more productive than conventional imaging methods. Unlike the x-ray CT scanner or the PET scanner, NMR imaging does not use potentially harmful x-rays or unstable nuclei. Instead, it works on the principle that when certain stable atomic nuclei are placed in a magnetic field and stimulated by radio waves of a particular frequency, they will re-emit some of the absorbed energy in the form of radio signals. This is called NMR. The strength and frequency of the radio signals are then fed into a computer which translates the information in an accurate image with high resolution or contrasts.

NMR is particularly suited to medical imaging because the nucleus of the hydrogen atom in water gives rise to the largest NMR signal from all stable nuclei and water is the major constituent of the human body. Since many disease states are characterized by an alteration in fluid levels, NMR could be a powerful diagnostic tool. It also means NMR effectively images soft tissues complementing x-ray technology which detects rigid body structures most easily.

NMR technology can also be applied to yield information about the function of body tissue (compared to x-rays which only yield information about structure). In NMR spectroscopy scientists have a probe to observe chemicals deep within the body so that bodily processes can be studied in a normal state, in a diseased state, and under the influence of medical treatment. In the future, scientists expect NMR spectroscopy will enable them to observe tumor growth, or monitor how nerve cells deteriorate in nerve degenerating diseases, and then observe how such conditions respond to therapy.

In 1983-84 Allen concentrated upon selecting the new state-of-the-art NMR equipment and designing projects which will explore methods of obtaining NMR images and techniques for analyzing results. Initially, research will concentrate on imaging animals with tumors or brain disease. Clinical work on human problems will begin next year, again focussing primarily on tumors.

DAVISON, Joseph, Ph.D.*
Professor, Department of Medical Physiology
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/07/29

NERVOUS CONTROL OF GASTROINTESTINAL SECRETIONS

Control of the secretions of gastrointestinal glands is achieved by a complex interaction of nervous, hormonal and paracrine (local chemical) transmitters. Until recently, nervous control of glands was believed to be mediated by just two transmitters, acetycholine (ACh) and noradrenaline and only three gastrointestinal hormones were positively identified. Scientists now know the digestive system manufactures, stores, and releases a large number of biologically active substances which might function as neurotransmitters, hormones or paracrine agents. Interest has focussed on a particular group of substances called peptides which are found in both the gastrointestinal tract and the central nervous system. The discovery of VIP, CCK/P, substance P somatostatin, and other so-called "brain neuropeptides" establishes a new link between the gut and the central nervous system and blurs earlier distinctions once considered definitive.

Davison is investigating how pancreatic, salivary and gastric secretions are regulated by these peptides and other substances. He studies how established transmitters operate at the cellular level. For example, electrophysiological and biochemical methods enable Davison to study how nerve transmitters and other secretory stimuli affect membrane and intracellular events in glands. He also investigates the physiology of putative or supposed transmitters which may involve identifying and characterizing new peptides.

In other projects, Davison explores how the spontaneous movement and secretion or absorption in the gastrointestinal system is controlled by certain reflexes, particularly vago-vagal and peripheral sympathetic reflexes.

Because the physiology and biochemistry of a gastrointestinal system is so fundamental to good health, this basic research will eventually lead to more understanding of many disease states.

McGHEE, James, Ph.D.*
Associate Professor
Department of Medical Biochemistry
Faculty of Medicine, The University of Calgary

Date of Appointment: 83/07/01

GENE EXPRESSION DURING ANIMAL DEVELOPMENT

The life of almost all animals begins with the union of sperm and egg to form a single cell, which then divides to produce the myriad of different cell types present in the adult organism. What are the important molecular steps in this process? How can one individual cell divide into two daughter cells that are biochemically different from each other? What kind of clock tells a cell when it is the right time to produce a product such as hair or teeth or blood? These are the fundamental riddles of developmental biology that McGhee is trying to approach.

All the above questions can be most conveniently studied in the small non-parasitic nematode *C.elegans* and McGhee is using this worm as a simple model for the development of higher organisms, including humans. Because these worms are transparent, all cell divisions can be followed inside the developing embryo, obviously an impossible feat in the study of human embryos. In contrast to humans where there are upwards of a trillion cells with incredibly complex lineages, an adult *C.elegans* has less than a thousand cells and the cell lineages are known exactly. Moreover, worms can be quickly grown in huge quantities, the genetics are superb and genes cloned and altered by modern recombinent DNA methods can be injected back into the adult gonads to see how they behave during embryonic development.

As a convenient molecular marker of development, McGhee is studying the appearance of several digestive enzymes in the embryonic intestine. He has identified one particular

enzyme, an esterase, that appears very early in the developing gut. The cell lineage indicates that there are only three cell divisions at which the decision to express this esterase can have been made. McGhee is using a combination of microscopy, biochemistry, genetics, and recombinant DNA technology to discover the chemical instructions that tell these digestive enzymes to turn on at the correct time, only in the gut and not, for example, in the muscles or nerves.

Answers to these questions are fundamental to all biology and will form a conceptual framework in which to understand the many human diseases in which certain genes are not expressed or, as in the case of cancer, expressed at the wrong time and in the wrong cells.

TYBERG, John, M.D./Ph.D.*

Professor

Departments of Medicine and Medical Physiology

Faculty of Medicine, The University of Alberta

Date of Appointment: 83/07/01

CARDIAC MECHANICS: FACTORS AFFECTING THE HEART'S PUMPING ACTION

Tyberg is investigating cardiac mechanics, most particularly the effects of pressure exerted by the sac around the heart called the pericardium. Tyberg and his associates have challenged established dogma by demonstrating that, with one exception, the effect of the pericardium cannot be measured by a conventional open catheter as is common clinical practise.

Doctors have mistakenly assumed pericardial pressure equalled intrathoracic pressure, but Tyberg has shown the contrary. This has important implications for the treatment of heart failure patients.

Other studies explore heart-lung interactions by measuring surface pressure between the lung and the pericardium during volume loading and positive end expiratory pressure. Identifying how much pressure the lungs exert on the heart may prove to be very important in patients with emphysema, pulmonary edema and fibrosis.

Tyberg is also investigating how certain drugs which have empirically been proven valuable, actually work. Preliminary work with the drug angiotensin (which decreases venous volume with little change in pressure) and the drug nitroprusside (which lowers pressure while maintaining or increasing volume) indicates certain agents change pericardial pressure by changing the capacity of the veins.

A fourth area of research involves the mechanics of non-ischemic myocardium (healthy area of muscle in the heart wall) adjacent to the ischemic area (area with deficiency of blood supply). Whether these areas perform normally or are actually depressed by an as-yet unknown mechanism is not clear.

Tyberg conducts both basic and clinical work in collaboration with eight other members of the Cardiovascular-Respiratory Research Group.

WANG, Jerry, Ph.D.

Professor, Department of Medical Biochemistry

Faculty of Medicine, The University of Calgary

Date of Appointment: 82/12/01

STUDIES IN CELL REGULATION

Living cells rely on an intracellular communication system to adjust cellular activities during changes in the external environment. The basic elements of this system are certain small molecules known as second messengers whose cellular concentration can be readily changed by disturbances from outside and whose function is to modulate various cellular processes. There are two general and universal second messengers: Ca^{2+} and cyclic AMP. The metabolisms and actions of these two messengers are interrelated by a host of enzymes and protein factors. The long term objective of this proposal is to elucidate the principles underlying the complex interactions in the communications system.

One of the major approaches is to select key enzymes and proteins for the study of their regulatory properties, and their interactions with other components of the system. The present focus is on a Ca^{2+} binding protein, calmodulin, which has been implicated in various cellular processes by regulating key enzymes or proteins in these processes. To elucidate the general mechanism of the action of calmodulin, the cyclic nucleotide phosphodiesterase is selected for detailed kinetic and thermodynamic study of its activation process. To investigate evolutionary and functional relationships among calmodulin-dependent proteins, as well as structure-function relationships of selected enzymes, monoclonal antibodies are developed as structure and function probes. Calmodulin-dependent protein kinases are studied to explore the complexity of the calmodulin regulatory system. A calmodulin-dependent phosphatase is studied in terms of its physiological significance. The protein kinases and phosphatase are selected for studies because they are expected to interact with many other proteins in the communications systems in the cells.

Another major approach is to use cultured cells to study calmodulin and calmodulin-dependent proteins under various culture conditions. These studies will illustrate how calmodulin functions in living cells and how calmodulin and its regulated protein may be controlled under different physiological conditions. The Cell Regulation Unit has obtained evidence to suggest calmodulin may function in controlling the phosphorylation states of tyrosine. The phosphorylation of protein tyrosyl residue has been implicated recently in the modulation of cell growth. Another finding is that cAMP phosphodiesterase, an enzyme which is involved in the metabolism of cAMP, a second messenger, exists as different isozymes in mammalian brain. This observation may lead to a better understanding of how the two major second messenger systems, Ca^{2+} and cAMP systems, are inter-linked.

Scholarship Awards

ANDERSON, Maurice, Ph.D.
Assistant Professor
Department of Pharmacology & Therapeutics
Faculty of Medicine, The University of Calgary

Date of Appointment: 83/01/04

DEVELOPMENT OF NEUROMUSCULAR JUNCTION

This is a molecular study of the synaptic apparatus joining nerves and skeletal muscles. During embryonic development, growing nerves make contact with skeletal muscle cells and this generates specialized cellular structures at the forming motor endplace. This poorly understood "trophic" or "inductive" interaction appears to also contribute to the maintenance of neuromuscular apparatus in adults. Degenerative diseases such as muscular dystrophy may involve lesions in these mechanisms.

Anderson uses monoclonal antibodies as probes to study the molecular structure of the neuromuscular junctions and also observes their formation in cell cultures.

BIDDLE, Fred, Ph.D.
Assistant Professor, Department of Pediatrics
Faculty of Medicine, The University of Calgary

Date of Appointment: 81/09/01

GENETIC STUDIES OF THRESHOLD TRAITS OF MAMMALIAN DEVELOPMENT

This is a study of birth defects which are genetically determined and are labelled "threshold traits" because not all individuals with a genetic disposition to express the defect do so. Cleft lip and spina bifida are examples of threshold traits. Using mouse embryos, Biddle is investigating the interaction between the genetic information, its control of developmental processes and variable environmental "insults" or factors.

He is also studying the cellular processes that regulate the normal segregation of the sex chromosomes (X and Y) in spermatocytes, again using the mouse model which includes a series of inherited mutations with birth defects. Since similar birth defects occur in man, these studies on genetic and environmental factors will increase our understanding of the probability of producing abnormal sperm.

BOISVERT, Donald, M.D., Ph.D.
Associate Research Professor
Department of Surgery
Faculty of Medicine, The University of Alberta

Date of Appointment: 81/01/01

PATHOPHYSIOLOGY AND THERAPY OF CEREBROVASCULAR OCCLUSION

This is a study of brain damage following occlusion of a cerebral artery, commonly known as a stroke. While scientists know some irreparable brain damage occurs minutes after a stroke, recent investigations indicate variable amounts of brain tissue survive for hours or days in a "live" but non-functional state. The length of survival depends upon the severity and duration of the decrease in blood supply. Boisvert is identifying the factors which determine the level of residual blood flow during initial hours after the stroke occurs.

This study may lead to the development of emergency treatment strategies to minimize the destruction of brain cells in stroke patients.

BOURNE, Gregory, M.D.
Assistant Professor, Department of Physiology
Faculty of Medicine, The University of Alberta

Date of Appointment: 82/10/28

THE REGULATION OF TESTICULAR GnRH RECEPTORS AND GnRH-LIKE PEPTIDES AND THEIR ROLES IN STEROIDOGENESIS

This is a study of inter-related hormones which regulate gonadal function, particularly a newly identified compound localized in the ovaries and testes. This new compound seems to function like GnRH, peptide produced in the hypothalmus known to regulate production of eggs and ovulation in females and production of testosterone and sperm in males. The GnRH-like compound also appears to control sexual maturation and senescence.

Bourne's research may provide the molecular basis for the development of new drugs such as a male contraceptive, a treatment for precocious puberty, or a treatment for decreased gonadal function in old age.

BOWLING, Douglas, Ph.D.
Assistant Professor
Department of Medical Physiology
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/09/14

PROJECTIONS OF SINGLE IDENTIFIED RETINAL AXONS

This is a study of the long axons, extensions of nerve cells in the retina which relay visual signals from the eye to the brain. After transmission via the axons, the brain processes the signals of color, form, brightness and movement. This project is designed to discover how information is encoded for transmission, how the axon connections are distributed at sites of termination in the brain, and how the connections are formed during development.

Though this research is clearly relevant to fundamental questions regarding vision, it is also more generally applicable to other questions in neurological medicine.

BULLOCH, Andrew, Ph.D.
Assistant Professor
Department of Medical Physiology
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/07/01

CELLULAR BASIS OF ADULT NEURONAL PLASTICITY

This is a study of the capabilities of the adult nervous system to grow and adapt to change. This involves combined electrophysiological and morphological study of adult molluscan neurons as they exhibit neurite outgrowth and synapse formation. Neurons are examined both within the normal environment of ganglia in organ culture and also as dissociated cell cultures. Additionally, neurite outgrowth can be invoked *in situ* by various manipulations involving trauma to the animal, but not directly damaging the nervous system. The goal of such studies is to determine the factors which can evoke growth and determine the specificity of synapses in the adult nervous system. This information is relevant to the treatment of injuries, paralysis and other disease states where nerves are damaged.

BURKA, John, M.D.
Assistant Professor, Department of Pharmacology
Faculty of Medicine, The University of Alberta

Date of Appointment: 81/08/01

THE ROLE OF AA METABOLITES IN AIRWAYS HYPERREACTIVITY

This is a study of products of arachidonic acid (AA) which contribute to the tone of bronchial airway smooth muscle. In disease states such as asthma, there is increased synthesis and activity of broncho-constrictor agents. Burka is identifying the products of AA, determining their effect on airways physiology, and exploring mechanisms which could limit their activity. This study may lead to improved treatments for asthma.

Burka is also investigating two other diseases: gall bladder disease (role of AA metabolites) and rheumatoid arthritis (synovial fluid and leukocytes).

CARNE, Thomas, Ph.D.
Assistant Professor, University Biochemistry Group
Departments of Medicine and Science
The University of Calgary

Date of Appointment: 81/09/01

BIOSYNTHESIS OF PITUITARY HORMONES

This is a study of enzymes in the pituitary gland which synthesize three peptides from a common precursor. These hormones control many aspects of the body's metabolism including synthesis of steroids, mobilization of lipid from the liver and adipose tissue, and salt and water reabsorption. Carne is identifying the products formed by reacting the enzymes with precursors synthesized from messenger RNA *in vitro*. He also works with synthetic peptides.

This research may lead to the development of new drugs which inhibit specific hormonal production and can be used to treat disorders such as Cushing's Syndrome where there is an excess of one pituitary hormone.

DANIELSON, Terry, Ph.D.
Assistant Professor
Faculty of Pharmacy & Pharmaceutical Sciences
The University of Alberta

Date of Appointment: 81/07/01

METABOLISM AND PLASMA LEVELS OF CLINICAL MONOAMINE OXIDASE INHIBITORS

This is a study of monoxidase inhibitors, drugs used to manage psychiatric illnesses. Though drugs like phenezine appear to benefit patients, scientists don't know why nor do they understand why often 10 to 14 days of treatment are required before any improvement appears. Danielson is investigating how the body handles phenelzine after acute or chronic dosing by measuring drug levels in animal tissue and in the plasma or urine of psychiatric patients. Differences will be related to the development of antidepressant or toxic responses.

Danielson is also using animal models to investigate new psychoactive substances.

DASGUPTA, Mrinal, M.D.
Assistant Professor, Department of Medicine
Faculty of Medicine, The University of Alberta

Date of Appointment: 82/07/01

MBP SPECIFIC CIC IN MULTIPLE SCLEROSIS

This is a study to establish biological assays to detect immune complexes (IC) in the blood and their relationship to disorders such as lupus, cystic fibrosis and multiple sclerosis (MS). In these autoimmune diseases, the immune complexes (protein antibodies plus disease-producing agents) seem to cause disease rather than fight it. Dasgupta has discovered IC level is important in multiple sclerosis patients. These ICs contain a protein found in the "myelin" covering of nerve fibres and degradation of this myelin causes the crippling symptoms.

Dasgupta is further investigating specific "myelin" in the ICs of large numbers of MS patients to see if the ICs could modulate the clinical expression of symptoms. This may lead to new forms of therapy and possibly a vaccine. The same techniques in IC research are also being applied to a form of kidney disease and cystic fibrosis.

DUFF, Henry, M.D.
Assistant Professor, Department of Medicine
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/07/01

MECHANISTIC APPROACH TO ANTIARRHYTHMIC THERAPY

This is a study of the mechanisms of drug action for drugs used to treat cardiac diseases. Duff evaluates known drugs, develops new ones, and uses drugs as probes to further understand the basic physiology of the heart. In animal and clinical studies, he particularly investigates antiarrhythmic drugs like quinidine and mexeletine, which are used to control irregular heart rhythms.

In more basic studies, he explores the electrophysiologic changes caused by drugs. This includes a search for specific receptors on heart cell membranes, knowledge which would lead to improved specifically-targeted drugs with less side effects.

FORD, Gordon, M.D.
Assistant Professor
Department of Internal Medicine
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/07/01

INTERDEPENDENCE OF THE LUNG, RIBCAGE AND DIAPHRAGM DURING ATELECTASIS

This is a study of atelectasis, (areas of lung collapse), which arises from airway disease or accompanying other lung disorders. Atelectasis is particularly common in patients who have had upper abdominal surgery. Ford is investigating the cause of postoperative diaphragm dysfunction and developing experimental therapies.

Once the physiological mechanism is understood and test therapies have proved beneficial, they will be applied to clinical studies for the treatment and possible prevention of atelectasis.

FRITZLER, Marvin, M.D., Ph.D.
Associate Professor
Department of Internal Medicine
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/07/01

ANTINUCLEAR ANTIBODIES: AUTOIMMUNE DISEASES

This is a study of antinuclear antibodies in the serum of patients with autoimmune diseases (diseases where the immune system breaks down and seems to cause disease rather than fight it). Scientists don't understand why unusual antibodies coincide with certain diseases. Fritzler is screening the blood of thousands of donors and follows patients to see if the antibodies are precursors of the disease. He is also using biochemistry techniques to isolate, purify and characterize corresponding nuclear antigens (substances capable of inducing the formation of antibodies).

GILES, Wayne, Ph.D.*
Associate Professor, Department of Physiology
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/01/01

ELECTROPHYSIOLOGY OF ISOLATED CARDIAC CELLS

This is a study of electrical currents at the level of the single heart cell, a study made possible through a new technique called the voltage clamp method. Giles measures very small currents created by ions moving through a pore or channel in the cell membrane. Thousands of these events are believed to control the pacemaker potential, or ability of the heart to beat spontaneously, and the action potential which triggers and controls the heart's pumping action.

Giles uses the same technology to study the effect of autonomic transmitters and collaborates with clinical researchers in investigating specific effects caused by drugs. He is also working on realistic computer models of electrical activity in the pacemaker region of the heart. Such models would be a useful tool for further understanding various clinical problems.

HANGARTNER, Thomas, Ph.D.
Associate Professor
Department of Applied Sciences in Medicine
Faculty of Medicine, The University of Alberta

Date of Appointment 81/01/01

DUAL ROTATION COMPUTED TOMOGRAPHY SYSTEM FOR BONE AND TISSUE DENSITOMETRY

This is a study of bone disease made possible with a special computer tomography scanner which measures bone density. The scanner enables Hangartner to observe growth and maintenance patterns in the human skeleton. He can determine how bones are affected by hormones, diet, exercise, drugs and other treatments. He is comparing the efficacy of various treatments and has, for instance, found that intermittent drug therapy seems more effective than the traditional prolonged drug intake.

HANLEY, David, M.D.
Assistant Professor, Department of Medicine
Faculty of Medicine, The University of Calgary

Date of Appointment: 81/04/01

PARATHYROID HORMONE (PTH) SECRETION

This is a study of the mediators of parathyroid hormone secretion. PTH is the main regulator of calcium metabolism, a process which is important to normal cell function in all body tissues. This study uses normal animal tissue and abnormal human tissue from parathyroid disease patients.

Abnormalities of parathyroid function have been noted in many common disease states: kidney stones, chronic renal failure, generalized bone disease such as osteoporosis, and benign tumors of parathyroid glands.

HART, David, Ph.D.*
Professor, Department of Microbiology & Infectious Diseases
Faculty of Medicine, The University of Calgary

Date of Appointment: 83/07/01

IMMUNOCHEMICAL CHARACTERIZATION OF PLASMINOGEN ACTIVATORS

This is a study of proteolytic enzymes which play a central role in the regulations of cells and relate to many diseases. For example, uncontrolled enzymes can lead to blood clotting or to the tissue damage that occurs with rheumatoid arthritis.

Hart is investigating a group of enzymes called plasminogen activators which have been associated with cells of the immune system, the hematopoietic system, and tumor cells. He uses animal models to study the enzyme regulation at the cellular and systemic level. Once an information base is established, samples from healthy and diseased tumors will be analyzed in collaboration with rheumatologists and hematologists.

Hart is Chairman of the new Immunological Sciences Research Group at The University of Calgary.

HICKS, T. Philip, Ph.D.
Assistant Professor
Department of Medical Physiology
Faculty of Medicine, The University of Calgary

Date of Appointment: 81/09/01

IDENTIFICATION OF SYNAPTIC TRANSMITTERS IN THE MAMMALIAN VISUAL SYSTEM

This is a study of how visually responsive neurons in the brain communicate via chemical transmitters. Hicks is investigating the chemical mediators, particularly amino acids, to determine their role in processing visual information. He hypothesizes that different portions of the visual pathway which are anatomically segregated and have different functions are also separated by the use of different synaptic transmitters. His investigations are carried out at the level of the single cell using neurochemical, pharmacological and physiological techniques on animal models.

HINDSGAUL, Ole, Ph.D.
Assistant Professor, Department of Chemistry
Faculty of Science, The University of Alberta

Date of Appointment: 81/10/01

BIOLOGICAL RECOGNITION OF COMPLEX CARBOHYDRATES

This is a study of how protein receptor-sites specifically recognize complex carbohydrates. The recognition process is a primary step in many body functions such as hormonal regulation, immunological processes, cell recognition and adhesions. Hindsgaul is looking for the molecular description of how the carbohydrates are recognized. He believes the surface of complex sugars contain discreet, predictable topographical features.

This basic research will lead to more understanding of how the mechanism mediates normal and abnormal body functioning.

HOAR, David, Ph.D.
Associate Professor
Department of Medical Biochemistry
Faculty of Medicine, The University of Calgary

Date of Appointment: 81/09/01

DNA SEQUENCE DIVERSITY IN MAN

This is a study of DNA sequence changes in relation to specific inherited diseases. Alterations in DNA sequences appear to be caused by mechanisms apparently similar to the function of RNA tumor viruses. Of the several thousand genetically-inherited diseases, very few have been characterized (the molecular structure identified), to sufficiently identify the basic defect. New molecular biology and recombinant DNA techniques now allow Hoar to identify DNA sequence changes with specific diseases. If he can establish linkage associations, the information could be used for diagnostic studies. In the future, physicians may be able to precisely predict who will inherit certain diseases, an important step towards prevention.

HOFFER, Andy, Ph.D.
Assistant Professor
Departments of Medical Physiology
and Clinical Neurosciences
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/11/05

NEURAL CONTROL OF MOVEMENTS

This is a study of how neural function controls muscle contraction leading to voluntary movement. Hoffer records electrical currents in single, specifically-identified nerve cells in the spinal cord during normal animal movement. This is possible because of recently developed recording devices which are surgically implanted in animals. Hoffer is studying three aspects: the "language" of motor neurons, the electrical activity of sensory nerve fibres bringing information from the muscles to the motor neurons, and the communication between the spinal cord segments and higher levels of the brain.

Hoffer's implantable interfaces with nerve and muscle have recently found clinical application in the control of prosthetic limbs in amputees. This research is also very relevant to the development of new therapies and diagnostic procedures for neurological disorders like Parkinson's Disease.

IATROU, Kostas, Ph.D.
Assistant Professor
Department of Medical Biochemistry
Faculty of Medicine, The University of Calgary

Date of Appointment: 81/07/01

THE CHORION OF BOMBYX MORI AS A MODEL SYSTEM FOR THE STUDY OF THE ORGANIZATION, EXPRESSION AND EVOLUTION OF EUKARYOTIC MULTIGENE FAMILIES

This is a study of mechanisms regulating differential gene expression which results in normal or abnormal cellular differentiation and development. The chorion (eggshell) of the silkmoth is used as a model system because it is composed of many distinct proteins encoded by a large number of genes whose expression is developmentally regulated according to a strict temporal program. Wild type and mutant silkmoth strains are used for the analysis of the molecular organization of chorion genes expressed at different stages of oogenesis. Iatrou is identifying elements that may be involved in the control of chorion gene activation, and testing regulatory models of differential gene activity.

Understanding gene regulation at the molecular level may lead to more understanding of abnormal cellular behaviour and eventual treatment for disorders of cell differentiation and development, among which genetic defects and cancer are paramount.

JARVIS, Simon, Ph.D.
Assistant Professor, Department of Physiology
Faculty of Medicine, The University of Alberta

Date of Appointment: 82/08/01

MOLECULAR PROPERTIES AND REGULATION OF THE NUCLEOSIDE TRANSPORT SYSTEM

This is a study of nucleosides, agents used in the treatment of viral and neoplastic diseases. Because the agents (nucleoside analogs) enter cells through a saturable transport mechanism in the cell membrane, the transportability of an analog is an important determinant of cytotoxicity. Jarvis is investigating the molecular basis of nucleoside transport using a high-affinity nucleoside transport inhibitor. Once the membrane components are identified, he will examine the regulation and synthesis of nucleoside transport protein.

This study has direct relevance to viral and cancer chemotherapy.

JAWORSKI, Martine, M.D.*
Associate Professor, Department of Pediatrics
Faculty of Medicine, The University of Alberta

Date of Appointment: 83/07/01

PATHOGENESIS OF INSULIN DEPENDENT DIABETES MELLITUS

This is a study of juvenile-onset insulin-dependent diabetes. Scientists now believe genetically predisposed individuals may acquire diabetes through a complex interaction between an outside event such as a viral infection and the response of the person's immune system. Jaworski is investigating the genetic susceptibility and the autoimmunity (where cells in the immune system cause rather than prevent disease) of juvenile diabetes. She compares the immunoregulation of diabetics, their close family members, and normal individuals. So far, studies indicate the diabetic child may have an imbalance of helper and suppressor cells in his or her immune system.

Jaworski's work has potential for developing new methods of early diagnosis and new therapies that manipulate immune responses. Preliminary evidence with animals suggests modulating the immune system can inhibit the course of the disease and perhaps prevent it.

JENSEN, Susan, Ph.D.
Assistant Professor, Department of Microbiology
Faculty of Science, The University of Alberta

Date of Appointment: 81/07/01

BIOSYNTHESIS OF NOVEL PENICILLIN AND CEPHALOSPORIN ANTIBIOTICS

This is a study of the natural production of penicillin and cephalosporin antibiotics by the organism *Streptomyces clavuligerus*. DNA technology is used to increase the production of the *Streptomyces clavuligerus* enzymes which synthesize the antibiotics. If these enzymes can be harnessed as biological catalysts (in cell-free systems) to synthesize many antibiotics, the expensive chemical modifications currently used to enhance antibiotics will be unnecessary. This means more effective and reasonably-priced antibiotics.

KAUFMAN, Susan, Ph.D.*
Associate Professor, Department of Medicine
Faculty of Medicine, The University of Alberta

Date of Appointment: 83/04/01

CONTROL MECHANISMS OF FLUID AND ELECTROLYTE BALANCE

This is a study of how the body controls intake and output of salt and water, factors pertinent to many disease states, particularly hypertension and congestive heart failure. To control salt and water, the body needs a mechanism for measuring fluid volume and salt content. Kaufman uses animal models to investigate volume sensors in the heart. She is investigating whether signals from the volume sensors are then transmitted directly to the brain or whether they cause hormonal changes which alter thirst, salt appetite and urine output.

Preliminary research by Kaufman and others indicates there might be such a hormone originating from the heart. She is specifically applying the principle to studies of congestive heart failure.

KOOPMANS, Henry, Ph.D.*
Associate Professor
Department of Medical Physiology and Psychology
Faculty of Medicine and Social Science
The University of Calgary

Date of Appointment: 83/08/22

THE INTERNAL CONTROL OF FOOD INTAKE

This physiological study of food intake is directed toward eventually discovering a new medical treatment for obesity. Koopmans' previous work indicates there are two types of signals that inhibit food intake: a hormone released from the stomach inhibits short-term intake and a signal, probably a hormone, arising in the lower small intestine reduces long-term intake. Using animal models, Koopmans is investigating the chemical nature of these signals, the foods that release them and the way they affect the brain.

Since obesity increases the risk of many debilitating illnesses such as diabetes, stroke and heart disease, this research has widespread relevance.

LEE, Patrick, Ph.D.
Assistant Professor
Department of Microbiology and Infectious Disease
Faculty of Medicine, The University of Calgary

Date of Appointment: 81/07/01

THE MECHANISM OF VIRUS ATTACHMENT ONTO HOST CELLS

This is a study of the first step in viral invasion — the way a virus attaches to the host cells. The reovirus (REO, respiratory enteric orphan) found in the human digestive tract is a valuable research model because the virus-cell attachment apparatus (protein σ1) has been identified and the viral gene that codes for this attachment protein is easily isolated.

It is believed that the virus gains entry into the host cell by first anchoring itself via the attachment protein σ1 onto specific "receptors" on the host cell membrane. Using monoclonal antibody production and genetic engineering, Lee is investigating the biochemical nature of the virus attachment apparatus and the cellular receptor. Understanding the process is a step in the future development of antiviral measures designed to block cell-virus interactions at the plasma membrane level.

LEFEBVRE, Yvonne, Ph.D.
Assistant Professor, Department of Biochemistry
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/07/01

PASSAGE OF STEROID AND THYROID HORMONES ACROSS THE NUCLEAR ENVELOPE OF MAMMALIAN CELLS

This is a study of why some breast carcinomas are unresponsive to steroid hormone treatment. Currently hormone manipulations cause regression in about 25 percent of breast carcinomas. Because steroid hormones interact with the gene, they must enter the nucleus via a double membrane system, the nuclear envelope which forms a barrier between cytoplasm and nucleus.

Lefebvre hypothesizes passage across this nuclear envelope may be defective in unresponsive tumors. She is investigating the molecular mechanisms by which steroids traverse the nuclear envelope of normal mammalian target and non-target cells, as well as steroid-responsive and steroid-unresponsive neoplastic cells.

LEUNG, Wai-Choi, Ph.D.
Associate Research Professor
Department of Medicine
Faculty of Medicine, The University of Alberta

Date of Appointment: 82/07/01

MOLECULAR CLONING OF VIRAL NEUTRALIZATION ANTIGEN AND HUMAN TUMOR ANTIGEN

This is a study of ways to use molecular genetic technology to produce effective vaccines for virus-induced diseases. Experimental vaccines recently developed for herpes simplex virus and influenza virus seem effective. However, the minute amounts of neutralization antigen that can be isolated from purified virus prevents large-scale production of the vaccines. Leung is mass producing the virus neutralization antigens in genetically-engineered microorganisms which should reduce production costs and possible hazards.

A second project focuses on the molecular cloning of an antigen associated with human melanoma (pigment-bearing malignant tumors). By identifying the molecular structure of the gene for the antigen (known to be a glycoprotein on the tumor cell surface), the antigen could act as a marker to study tumor development.

MacVICAR, Brian, Ph.D.*
Assistant Professor
Department of Medical Physiology
Faculty of Medicine, The University of Calgary

Date of Appointment: 83/01/01

NEURONAL BASIS FOR SYNCHRONY DURING SEIZURE

This is a study of brain seizures, particularly epileptic seizures which frequently start in the hippocampus. Seizures are believed to be caused by sudden, abnormally large excitation of a large group of nerve cells. MacVicar is investigating why the cells in the hippocampus fire simultaneously and how they are interconnected.

New technology allows MacVicar to record the cellular activity of live nerve cells as they are affected by convulsants (agents which induce seizures). Animal models are used for this research.

MANNONI, Patrice, M.D.
Associate Professor, Department of Pathology
Faculty of Medicine, The University of Alberta

Date of Appointment: 82/10/01

ANTIGEN CHARACTERISTICS OF HEMATOPOIETIC STEM CELLS

This is a study of how normal and leukemic blood cells differ in development and structure. Mannoni studies surface membrane markers using monoclonal antibodies produced *in vitro* by mouse cells immunized against leukemia or normal cells and infused with tumor cell lines. Cell culture techniques allow him to study the possible expression of these markers during normal and leukemic cell proliferation. Mannoni is looking for what are called "oncogenes", little understood genes which some scientists believe may undergo change when cancer occurs, or which may be caused by the cancer. The project also includes an investigation of how the membrane markers are modified by external agents such as interferon.

MARANDA, Bruno, Ph.D.*
Assistant Professor, Department of Surgery
Surgical Medical Research Institute
Faculty of Medicine, The University of Alberta

Date of Appointment: 83/05/17

IMMUNO-CYTOCHEMICAL INVESTIGATION OF AXONAL TRANSPORT

This is a study of the movement of materials from cell centre to nerve terminals and back via axons. Maranda is investigating the chemical nature of membrane-bounded particles which are transported in the axons and he is identifying the cytoskeletal structures involved. He uses conventional and monoclonal antibodies in conjunction with video-enhanced microscopy. Amplifiers and a television camera create a system sensitive enough to observe how fluorescently-labelled particles move through living axons.

Better understanding of axonal transport will lead to more information about neurological diseases, particularly those involving degeneration of peripheral nerves.

MATHESON, David, M.D.
Assistant Professor, Department of Pediatrics
Faculty of Medicine, The University of Calgary

Date of Appointment: 81/07/01

ALTERATIONS IN IMMUNE REGULATION AND CELL-MEDIATED IMMUNITY INDUCED BY VARIOUS FORMS OF INTERFERON

This is a study of how interferon affects natural killer (NK) cells. These white cells have a special ability to kill other cells that have been infected by a virus or become malignant and their activity varies according to naturally occurring factors or drugs. Several patients with cancer have markedly depressed NK activity, but it is not known if this is cause or effect.

Matheson is testing the effects of two types of interferon on NK, as well as other immune functions, and he has found in some patients interferon leads to decrease in NK. He is also investigating how some drugs influence DNA metabolism and how changes in the DNA building blocks affect the level of NK activity.

McFADDEN, Grant, Ph.D.
Assistant Professor, Department of Biochemistry
Faculty of Medicine, The University of Alberta

Date of Appointment: 81/01/01

MOLECULAR BIOLOGY OF TUMORIGENIC SHAPE FIBROMA POXVIRUSES

This is a study of the molecular interplay between one particular tumor-promoting virus, the poxvirus in rabbits, and its target cell. This virus is the only DNA tumor virus which does not exert its effect from a location in the cell nucleus. It can be studied in tissue culture cells grown in the lab.

McFadden is attempting to dissect out the viral genes responsible for the virus's oncogenic potential and to analyze those genes using recombinant DNA cloning and DNA-mediated gene transfer. Since the poxvirus has never been systematically studied at the molecular level before, this research may clarify how a mammalian cell transforms itself into an unregulated and rapidly-dividing tumor cell.

MILLER, Rodman, Ph.D.
Assistant Professor, Department of Anatomy
Faculty of Medicine, The University of Calgary

Date of Appointment: 81/10/01

FREEZE FRACTURE LOCALIZATION OF ANTIGENS AND OF CHOLESTEROL

This is a study of the development of freeze fracture techniques to identify specific structures in membranes; currently the technique, called freeze fracture electron microscopy, yields a picture of individual proteins as particles imbedded in a (fractured) biological membrane. However, it has not been possible to associate a size or shape of a membrane particle with a particular protein. Miller is developing a technique which uses dyes bound to biologically active materials and an argon laser to selectively heat regions of the membrane. The procedure should allow scientists to specify the molecular identity of objects seen through freeze fracture.

This technique will have many applications in medical research because investigators will be able to locate membrane receptors in a variety of tissues. Miller will apply the method to locate neurotransmitter receptor cells in the retina.

In a second aspect of his research, Miller is using a cholesterol binding drug to locate cholesterol in biological membranes.

MILOS, Nadine, Ph.D.*
Assistant Professor, Department of Anatomy
Faculty of Medicine, The University of Alberta

Date of Appointment: 83/09/01

FACTORS CONTROLLING PATTERN FORMATION BY NEURAL CREST CELLS

This is a study of the mechanisms which control the arrangement and pattern of cells. Scientists don't understand how individual cells come together to form a functional group such as an organ. Using the neural crest cells of a species of toad, Milos is studying cellular pattern formation at the earliest embryonic stages of development.

Milos believes the cells may communicate with one another via a chemical gradient which enables them to locate their positions in relation to other cells and shift position. She hopes to isolate and characterize the biochemical components forming this gradient as well as identify any relevant changes in cell surface properties.

Understanding this mechanism will lead to more knowledge about inappropriate cellular combinations that occur in congenital defects or in the development of tumors with subsequent metastasis.

MINUK, Gerald, M.D.*
Assistant Professor, Department of Medicine
Faculty of Medicine, The University of Calgary

Date of Appointment: 83/07/01

ROLE OF GABA IN LIVER DISEASE

This is a study of γ-aminobutyric acid (GABA), a potent amino acid neurotransmitter that has been implicated as a cause of certain features of liver disease. Normally GABA produced elsewhere in the body is metabolized by the liver or secreted into the bile duct drainage system but Minuk has discovered some GABA remains in the liver where it presumably carries out certain functions. His preliminary investigation of these functions indicates that they may be involved with normal bile flow or changes in insulin and glucagon effects on the liver. Abnormal metabolism of GABA by the liver appears to play a role in the suppression of normal brain activity that is seen with severe liver disease.

Understanding the physiology of GABA will give insight into why people with severe liver disease develop metabolic abnormalities and occasionally coma. Minuk is particularly interested in a serious disorder of the central nervous system found in patients with advanced liver disease. The disease, called hepatic encephalopathy, results in depressed brain cell activity and in its severest form often leads to death.

MOORE, Graham, Ph.D.*
Assistant Professor
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/07/01

THE SYNTHESIS AND EVALUATION OF PEPTIDE HORMONES AND ANALOGUES

This is a study of how two peptides, angiotensin and vasopressin, function in normal and abnormal states. Because both these peptides are involved in hypertension and heart failure, Moore is searching for ways to eliminate their undesirable effects in cardiovascular diseases. He is studying the biosynthetic pathways which give rise to the peptides and how they act at their tissue receptors.

This information prepares the way for synthesizing peptides which correct the negative action and could then be incorporated into drugs for the diagnosis and treatment of heart failure.

TAYLOR, Diane, Ph.D.
Associate Professor
Department of Medical Microbiology
Faculty of Medicine, The University of Alberta

Date of Appointment: 81/07/01

CHARACTERIZATION OF BACTERIAL PLASMIDS

This is a study of antibiotic resistance in bacteria which cause food poisoning and severe infection in blood and organs of both man and farm animals. In recent years bacteria have become increasingly resistant to antibiotics, probably due to their frequent use in clinical medicine and in livestock rearing. Taylor is investigating how bacterial resistance develops, the mechanisms involved, and how resistance can be eliminated from bacteria. Recombinant DNA and cloning are employed to focus on individual bacterial genes which specify antibiotic resistance.

This study will provide the basis for improved antibiotics and clinical treatment of infectious diseases.

TYLER, Jonathan, Ph.D.
Assistant Professor, Department of Genetics
Faculty of Science, The University of Alberta

Date of Appointment: 81/08/01

STRUCTURE AND FUNCTION OF BIOLOGICAL MEMBRANES

This is a study of human red blood cell disorders to understand the molecular basis of specific heritable diseases. Certain diseases of the connective tissue (spherocytosis, stomatocytosis and others) affect red cell shape and function. Tyler is analyzing the network of proteins called the cytoskeleton which controls the shape of the red blood cell. Using the techniques of molecular genetics, he investigates both normal and diseased cells, specifically analyzing the structure of spectrin because a mutation of this protein has been related to abnormal cytoskeletal function.

If Tyler can accurately identify the molecular mechanism of the diseases, the information can be used to develop new clinical treatments.

WAISMAN, David, Ph.D.
Assistant Professor
Department of Medical Biochemistry
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/08/01

STUDIES OF CALCIUM BINDING PROTEINS

This is a study of the calcium proteins fundamental to the second messenger system which activates cell function. Calcium concentration rises in a normal, activated cell, but if there is too much calcium, the cell dies and tissue is damaged.

Waisman is examining whether the most well-known calcium binding protein, calmodulin, is the primary intercellular receptor and whether or not there are other binding proteins. He is also investigating the calcium binding activity of heart and brain tissue.

These basic studies have wide application to many disease states which appear to be accompanied by abnormal concentrations of calcium, problems such as muscular dystrophy and some heart disease.

WALSH, Michael, Ph.D.
Assistant Professor
Department of Medical Biochemistry
Faculty of Medicine, The University of Calgary

Date of Appointment: 82/09/01

ENZYME REGULATION BY CALCIUM

This is a molecular study of the biochemical mechanisms which control smooth muscle contractions. Walsh is investigating the second messenger system which activates cell function. He is specifically studying two identified second messengers, calcium which is mediated by the protein calmodulin, and cyclic AMP which is mediated by cAMP dependent kinase. In addition to studying how these processes control smooth muscles, Walsh is searching for new calcium binding proteins.

Smooth muscles in the body include the intestine, vascular muscle, uterus, trachea, esophagus and stomach. If this basic study yields information on how smooth muscles operate, scientists will better understand their malfunctions in conditions such as hypertension, muscular dystrophy, malignant hyperthermia, certain gastrointestinal, respiratory and cardiac disorders.

WENMAN, Wanda, M.D.
Associate Professor, Department of Pediatrics
Faculty of Medicine, The University of Alberta

Date of Appointment: 81/07/01

HUMAN INFECTIONS WITH CHLAMYDIA TRACHOMATIS

This is a molecular study of *Chlamydia trachomatis*, a specialized bacteria which causes a variety of human infections such as the eye disease trachoma. *C. trachomatis* is a major agent of venereal disease, more common than gonorrhea, and linked to a still expanding spectrum of disease. Infants born to infected mothers frequently develop pneumonia or eye infections.

Wenman uses recombinant DNA techniques to compare different strains of Chlamydia, investigate potential reagents for rapid diagnosis, and study the feasibility of vaccines.

WOODS, Donald, Ph.D.*
Assistant Professor
Department of Microbiology & Infectious Disease
Faculty of Medicine, The University of Calgary

Date of Appointment: 83/07/01

PATHOGENESIS OF PSEUDOMONAS AERUGINOSA DISEASE

This is a study of an infectious pneumonia caused by the bacterium *Pseudomonas aeruginosa*. For some unknown reason, people with cystic fibrosis, a serious congenital disorder of metabolism, are very susceptible to this lung infection. Woods has developed an animal model of chronic P. aeruginosa pneumonia and uses biochemical techniques to analyze the bacteria.

He is also investigating the circulating immune complex detected in the secretions and serum of Cystic Fibrosis patients.

POOR

QUALITY

ORIGINAL